

SCREEN-TO-PLOTTER UTILITY DOCUMENTATION

by John McMichael

----- AN INTRODUCTION -----

Welcome to the world of plotting with a TS 2068 computer and Commodore 1520 printer/plotter!! Your purchase of SCREEN-TO-PLOTTER will enable you to realize the many capabilities of the 2068/1520 combination in a very user-friendly environment.

Plotting a picture with the SCREEN-TO PLOTTER utility is as simple as doing a kiddie's connect-the-dots puzzle! You simply move an on-screen cursor about using either a joystick or the keyboard direction keys, positioning it on the periphery of a figure you want plotted and, by pressing the "D" key or "fire" button, the plotter will instantly draw a line segment from where the pen was to the cursor's location at the time the key or button was pressed. A plotted duplicate of a screen picture is easily accomplished by linking many small line segments together around the figure's perimeter. All the while, your plotter commands are being stored away in memory for saving and then, at a later date, may be loaded into SCREEN-TO-PLOTTER for picture reproduction on the plotter.

The 1520 printer/plotter can be said to be "intelligent" because the job of calculating the stepper motor movements required to drive the pen from one point to another is done by a micro-processor and ROM within the 1520 itself; the 2068 only needs to supply the two points. Also contained in the ROM is a table describing the plotter pen movements needed to construct the entire character set. The instructions to change character size, rotate characters, make dashed lines, and change pen color are also held in the ROM. Having all of this done external to the 2068 made writing SCREEN-TO-PLOTTER a much easier job.

----- THE PROGRAM -----

SCREEN-TO-PLOTTER loads in four parts & then auto-runs. The 1520 should remain OFF until you are notified to turn it ON at the program's start. The first question you are asked is whether you want to digitize a SCREEN\$ picture or reproduce a picture. If this is your first use of SCREEN-TO-PLOTTER, you must choose to digitize a picture as, obviously, you do not have a plot data block on tape to load for picture reproduction.

(D)IGITIZE SCREEN\$: Upon selecting this option, you will be presented with two more choices to make. They are:

(C)CURSOR ONLY or (L)INE TRACE: The decision to be made here is whether you want only the cursor to be superimposed on the screen or if you want a line to be drawn on the screen complementing every line that is drawn on the plotter. (C)CURSOR ONLY usually is best suited to plotting a picture that you have LOADED in, while (L)INE TRACE is best used in "freehand" drawing to the screen and plotter.

(L)OAD SCREEN\$ or (F)REEHAND PLOT: Selecting (L) will allow you to load in a SCREEN\$ picture you've previously drawn and saved to tape. With the choice of (F) you will be given a blank screen to work on. After loading a screen or electing to "freehand" a picture, you are told to "ADVANCE PLOTTER PAPER IF DESIRED" and "PRESS ANY KEY". Advance the paper by pressing the "paper feed" button on the 1520. Upon pressing any key, the machine code "work-horse" of SCREEN-TO-PLOTTER is called into action.

If you've loaded a picture that has color attributes you will observe that the color picture has been changed to a black and white one. It is my experience that positioning a cursor on a picture is more accurately done if the color is first removed. You will also notice that the picture has been "boxed in" and that a menu overwrites the bottom two screen lines. If you move the cursor to its horizontal and vertical limits within the box, using either a joystick or the keyboard direction keys, and check the coordinate readout part of the menu, you will see that your work area is limited in the x direction to 8-247 and in the y direction to 1-174. The x limitation is due to the plotter only being able to make 479 x steps. Since the plotter moves two steps for every pixel moved on the screen, the left and right-most 8 X 175 pixel columns had to be made inaccessible to the cursor. The y limit is due to the necessity of having a menu available on the screen at all times. A pull-down menu would have been nice, but was far beyond my programming know-how. Hopefully you will not find these constraints too unbearable.

You are now ready to put the plotter to work! The plotter commands that are now displayed and awaiting your selection are:

CDRAW: Pressing the "D" key or the "Fire" button on a joystick will result in a line being plotted from the current pen location to the current cursor coordinates. A line will also be drawn on the screen if you chose the line trace option earlier.

CMOVE: Pressing the "M" key will do exactly the same thing as draw only the plotter pen will be up. No line will be drawn on either the plotter or the screen.

CTEXT: Pressing the "T" key will allow text to be printed (or should I say plotted) at the cursor's current coordinates. You will be prompted for character size, character rotation, and whether or not the text string is to be centered or not. Only one lines' worth of printing is possible each time the CT command is used. SCREEN-TO-PLOTTER will inform you of how many characters of the selected size can be accepted for printing, depending on the position of the cursor. If you are too close to the right margin for even a single character to be printed, you will be notified to either choose a smaller character size or to move the cursor. Pressing ENTER in response to any text prompt will return you to the main menu. After the text is printed, the cursor will reposition itself to allow additional text to be appended. By moving the cursor to the very top of the screen, it is possible to print characters that are outside the boundary of the "box". This comes in handy when you want a title printed over a picture. Text is not printed to the screen at any time.

CCOLOR: Pressing the "C" key will allow you to change the plotter pen's color. After pressing "C", press the desired color key (1,2,4, or 0). Press the "Y" key to clear the screen.

CPAGE: Pressing the "P" key will advance the plotter's paper enough to provide a new blank page to plot upon. After pressing "P" you must respond to the "RESET DATA MEM POINTER?" prompt. If you press "Y" the data memory pointer will be set to it's starting location. This will effectively erase all plotter commands that were previously stored so that you may go on to build a new data block. Pressing "N" will retain the memory pointer so that any subsequent plotter commands will be added to the data block.

(ID)=DASH: After pressing the "I" key, you will be prompted for a dash size number. Enter 0 for a solid line, 1 for the smallest dash size on up to 15 for the largest size. All subsequent plotting and text will be done in the specified dash size.

(E)=Close Fig.: Pressing the "E" key will instantly draw from the cursor's coordinates to the coordinates of the last point moved to. This can be used to close up the perimeter of a fig.

(Q)UIT: Pressing the "Q" key will return you to BASIC, remove the boundary lines and plotter command menu, and prompt you to SAVE the current SCREEN\$ and/or plot data block. After responding to the two SAVE prompts, you are asked if you would like to exit the program. Selecting CYEs will stop the program while picking CNDs will take you to the (C)DIGITIZE/(R)EPRODUCE prompt. Further digitizing will overwrite an existing plot data block.

(R)EPRODUCE PICTURE: If you choose this instead of digitizing, a plot data block must already be in memory as a result of a prior digitizing session or a block must be LOAded in from tape. If you try to reproduce a picture without it's data being present in memory, you will be notified that a picture must be digitized or code block loaded. After the program verifies that data is present, you can advance the plotter's paper with the "paper feed" button on the 1520 and press any key to start the picture's reproduction. The plotter can be stopped before the entire picture is completed by holding the space bar down until the plotting is halted. After the reproduction is completed or if you "break" the plotting, you will then be asked if you would like another copy, and if you answer no, whether or not you want to save the plot data block.

Recovery response to memory usage and storage error reports:

While digitizing: The only report that may interrupt your digitizing process is the report: "MAX PLOT DATA STORAGE REACHED... (R)eset mem pointer, (Q)uit?". It is very unlikely that this report will ever pop up, but if you use a large enough number of plotter commands, like over 2700 of them, in digitizing a picture, you will reach a point where no more can be stored and get the "max storage reached" report. Respond to it by pressing (R) if you want to continue digitizing and don't care if the data block is erased. Press (Q) to return to BASIC where the data block can be saved as well as the current SCREEN\$.

While reproducing: If, while reproducing a picture to the plotter using a plot code block loaded from tape, the plotter should stop before it is finished with the picture and the report: "PLOT DATA ERROR DETECTED AT MEMORY LOCATION: xxxxx" is displayed on the screen, the most likely cause is a bad load from a damaged or poor quality tape. Try to reload the block and reproduce the picture again. If the same error occurs you may still be able to salvage the data block by examining the contents of memory locations before and after the reported error location. Knowing what the next action of the plotter should have been at the time it stopped will also be of some help. A plot data block is built by sequentially storing each plot command as it is executed. Plot data storage begins at address 50000 with each plot command being stored in accordance with the formats detailed on the following page.

Memory organization for stored plotter commands:

- 1,x,y = DRAW to (x,y). Three storage bytes are used.
- 2,x,y = MOVE to (x,y). Three storage bytes are used.
- 3,x,y = draw from (x,y) to the last coordinates "MOVED" to; i.e. the CLOSE FIG. command. Three storage bytes are used.
- 4,n = change pen to ink COLOR n; where n=0 is black, n=1 is blue, n=2 is green, and n=3 is red. Two bytes are used.
- 5,n = change DASH size to n; where n=0 is a solid line and n=15 is the largest dash size. Two bytes are used.
- 6,x,y,n1,n2,A,S,C,I,I,-,T,E,X,T
= Print TEXT at (x,y); where n1 = char. size, n2 = char. rotation (1=yes 0=no). The number of storage bytes used equals five bytes plus the number of characters printed.
- 7 = Advance paper to next PAGE. One storage byte is used.
- 0 = End of plot data marker. One storage byte is used.

Thus, to correct a plot data error, you will have to determine what number (0-7) should be POKed to the indicated memory error location in order to put things on the right track again.

SCREEN-TO-PLOTTER machine code memory map:

- A) Driver machine code: 23296-23551 (5B00-5BFF)
- B) Plot data storage: 50000-58191 (C350-E34F)
- C) SCREEN-TO-PLOTTER machine code: 58502-65367 (E486-FF57)
The SCREEN-TO-PLOTTER machine code was compiled using Novel-Soft's TIMACHINE *. I will provide a tape of the BASIC program that was compiled into m.c. to anyone who has previously purchased SCREEN-TO-PLOTTER for \$6.00 ppd.

SCREEN-TO-PLOTTER
&
2068/1520 DRIVER CODE
are
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John McMichael
1710 Palmer Drive
Laramie, WY 82070